(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 528 574 A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 92307072.6

(22) Date of filing: 03.08.92

(51) Int. Cl.[5]: H01R 4/24, H01R 25/14

(30) Priority: 21.08.91 GB 9118047

(43) Date of publication of application:
24.02.93 Bulletin 93/08

(84) Designated Contracting States:
DE FR GB IT

(71) Applicant: Hozelock Limited
Haddenham
Aylesbury Buckinghamshire HP17 8JD (GB)

(72) Inventor: Dineen, Christopher John
Nol Beech Green
Aylesbury, Buckinghamshire HP21 8JD (GB)

(74) Representative: Morton, Colin David et al
Keith W Nash & Co. Pearl Assurance House
90-92 Regent Street
Cambridge CB2 1DP (GB)

(54) Electrical connector.

(57) A low voltage electric cable connector especially intended for use outdoors, for example for garden lighting, comprising two connector parts (10, 12) which assemble into hinged relationship and snap fit together by relative pivotal movement about the hinge axis (34), the first part (10) incorporating spiked conductive elements (30) electrically connected within the part to a first electric cable (20), so that when the two parts are snap fitted together to sandwich and secure a second electric cable between them, the spikes of the conductive elements penetrate the insulation of the second electric cable electrically to connect the two electric cables together.

EP 0 528 574 A2

Field of the invention

This invention relates to a low voltage electrical connector.

Background to the invention

Electrical equipment for use outdoors, such as garden lighting, is for safety reasons operable on a low voltage (typically less than 50V) circuit derived from the mains supply through a step-down transformer. Commonly, several items of equipment will be operated on the low voltage circuit and there will often be a requirement to remove one or more such items, add a further item, or simply change the position of one or more items. This gives rise to a requirement for low voltage electrical connectors, whereby one low voltage electric cable can be electrically connected to another.

One known construction of low voltage electrical connector comprises two parts of electrically insulating material which can be fitted together by means of securing screws. The first part is permanently connected to a low voltage electric cable and incorporates elements of electrically conductive material in engagement with the respective conductors of said cable, said elements including spiked portions which protrude from the surface of said first part. A second low voltage electric cable is located against the protruding spikes of the first part of the connector, and the second part of the connector is secured to the first part by means of the securing screws to clamp the second electric cable between the two parts, thus causing the spikes to penetrate through the insulating covering of the second electric cable and effect an electrical connection between the two cables through said spiked elements.

The invention

According to the invention, there is provided a low voltage electrical connector formed in first and second parts of insulating material, the first part being permanently connected to a first electric cable and incorporating conductive elements in engagement with the conductors of said electric cable, said elements having respective spikes which protrude from the surface of said first part of the connector, the first and second parts of the connector being adapted to snap fit together to clamp a second electric cable between them and thereby cause the said spikes to penetrate through the insulating covering of the second electric cable in order to effect an electrical connection between the two cables.

Preferably, the two parts of the connector are elongate and assemble together with a hinging action at one end of the assembly and a press fit action at the other end of the assembly, thereby to squeeze the second electric cable against the spikes with a lever action. Preferably therefore, the spiked elements are located nearer the hinging end of the assembly than the end at which the two parts press fit together.

Both parts have formations at which the aforesaid hinging action and press fitting action are produced, and preferably the formations on at least one part, preferably the first part, are formed as pairs of laterally spaced upstands from the main body of said part at the respective ends thereof, defining between said formations on one side of the part and the formations on the other side a channel along which the second electric cable can be located to pass right through the connector from one end to the other.

In conjunction with this last-mentioned feature, the two parts of the connector are preferably separable from one another, whilst also being capable of assembly into a hinging relationship. Thus, assuming the first electric cable is connected or adapted to be connected to an item of electrical equipment, the connector enables such item to be tapped into an existing low voltage power line (which thus constitutes the second electric cable) without any requirement to sever the power line.

The two separable parts of the connector are preferably held in loose association with one another by a flexible joining tag.

The first electric cable is preferably terminated within the first part of the electrical connector. Thus, in a preferred embodiment of the connector, the first part of the connector is moulded firstly with a cable-receiving blind aperture extending longitudinally into it from one end of said part, preferably the end at which the two parts of the connector press fit together, and secondly with slots which extend transversely into said aperture adjacent its blind end, said slots receiving the aforesaid spiked elements as an irreversibly tight fit. The spiked elements are conveniently formed with prongs at their ends opposite to the spikes so that, when the spiked elements are driven into the slots, the prongs penetrate the insulating covering of the cable at the end of the first electric cable, which has been inserted into the aforesaid blind longitudinal aperture, thereby both permanently to anchor the first part of the connector to the end of said first electric cable and to effect engagement of said spiked elements with the conductors of said first electric cable.

Description of embodiment

A low voltage electrical connector in accordance with the invention is exemplified in the following description, making reference to the accompanying drawings, in which:-

Figure 1 shows the two part electrical connector in pictorial view, with the two parts separated;

Figure 2 is a transverse cross-section through the first part of the connector; and

Figures 3 to 6 show, in longitudinal cross-section, the sequence of steps involved in use of the connector to form an electrical connection between two electric cables.

Referring first to Figures 1 and 2, the connector comprises a first part 10 and a second part 12, both moulded of plastics insulating material, separable but held in loose association by a flexible joining tag 14.

The first part 10 of the connector comprises an elongate main body 16 having a blind longitudinal aperture 18 in which is received the end of a first low voltage electrical cable 20. The body 16 has on one face, referred to herein as the top, two upstanding side walls 22 which define a cable-receiving channel between them. The ends of the side walls 22 are formed with hook shaped formations, 24 and 26 respectively, for a purpose hereinafter described.

The body 16 is also formed with two slots extending from its top surface between the side walls 22 downwardly through the body to meet the longitudinal aperture 18 adjacent its blind end. These slots respectively receive as an irreversibly tight fit two elements 28 of conductive material which have prongs at one end and spikes at the other end. The prongs and spikes could be identical in form, but alternative terms are employed for the convenience of description. The two conductive elements 28 are driven downwardly into the slots, prongs first, so that these prongs penetrate the insulating covering at the end of the cable 20 inserted into the aperture 18, thereby both to anchor the first part 10 of the connector to the end of the cable and to engage the conductive elements with the conductors of said cable. The spikes 30 of the conductive elements remain upstanding from the base of the channel between the two side walls 22.

The second part 12 of the connector comprises a flat body 32 having cylindrical formation 34, 36 respectively for engagement with the hook formation 24, 26 of the first part of the connector. The second part 12 also has, at its end beyond the formation 36, a finger grip 38.

The arrangement is such that the second part 12 of the connector can be assembled to the first part 10 by bringing the cylindrical formation 34 into cooperation with the hook formation 24, thereby to form a hinge, and then turning the second part downwardly about the hinge to press fit the cylindrical formation 36 into the hook formation 26. The shape and dimensions of the assembly are such that the two parts assemble together, in the above-described manner, as a snap-fit.

The manner of use of the connector, to electrically connect the first low voltage electric cable 20 with another such cable, will be described with reference to Figures 3 to 6. First, however, it is mentioned that, in these figures, certain further features of the spiked conductive elements 28 can be seen.

Thus, with particular reference to Figure 3, the pronged end of each conductive element 28 comprises three prongs 40, including one prong for penetrating right through the first electric cable 20 to ensure strong anchorage of said cable. However, the spiked end of each element 28 comprises only the single spike 30 hitherto referred to. Immediately below this spike 30, each element is formed wih lands 42 which, by means of a suitable tool, enable the conductive elements 28 to be driven into the slots in the main body 16 of the first part 10 of the connector, during manufacture.

Figure 3 shows the connector with its two parts 10, 12 separated, ready for use to connect the first electric cable 20 to a second electric cable 44.

First, as shown in Figure 4, the connector 10, 12 and the second electric cable 44 are relatively positioned with the cable 44 partly entered into the channel between the side walls 22 of the first part of the connector.

In Figure 5, the cylindrical formation 34 of the second part of the connector has been engaged with the hook formation 24 of the first part of the connector to form a hinge, and, by means of finger pressure on the finger grip 38, the second part 12 is being turned about the hinge to urge the cylindrical formation 36 towards the hook formation 26. The second electric cable 44 is being pressed down into the channel between the side walls 22 of the first part of the connector, causing the spikes 30 of the conductive elements 28 to start to penetrate the insulating covering of the second electric cable.

Figure 6 shows the completed connection, the cylindrical formation 36 having been forced into cooperation with the hook formation 26 with a snap fitting action, clamping the second electric cable 44 between the two parts of the connector and driving the spikes 30 of the conductive elements 28 fully through the insulating covering of the second electric cable into engagement with the conductors of this cable. There is thus now established an electrical connection between the first electric cable 20 and the second electric cable 44.

A significant point to appreciate about the above-described arrangement is that, due to the fact that the hook formations 24, 26 are formed on the upstanding side walls 22 which define between them the channel for receiving the second electric cable, and also due to the separability of the two parts of the connector, it is possible to tap the first electric cable 20 into any chosen point of the second electric cable 44 without any requirement to sever the second cable 44.

Thus, assuming the second electric cable 44 is a low voltage power line extending around an area in a garden, and the first electric cable 20 is connected or

adapted to be connected, at its end remote from the above-described connector, to an electrical appliance such as a garden lamp, then the lamp can readily be tapped into the power line at any convenient point along said power line suited to the position at which the lamp is to be sited. Moreover, at a later time, the appliance can readily be disconnected from the power line and reconnected elsewhere along the line. The very small punctures left in the insulating covering of the power line by such a procedure are neither dangerous nor significantly detrimental.

Various modifications of the above-described and illustrated arrangement are possible within the scope of the invention hereinbefore described.

Claims

1. A low voltage electrical connector formed in first and second parts of insulating material, the first part being permanently connected to a first electric cable and incorporating conductive elements in engagement with the conductors of said electric cable, said elements having respective spikes which protrude from the surface of said first part of the connector, characterised in that the first and second parts of the connector are adapted to snap fit together to clamp a second electric cable between them and thereby cause the said spikes to penetrate through the insulating covering of the second electric cable in order to effect an electrical connection between the two cables.

2. An electrical connector according to claim 1, characterised in that the two parts of the connector are elongate and assemble together with a hinging action at one end of the assembly and a press fit action at the other end of the assembly, thereby to squeeze the second electric cable against the spikes with a lever action.

3. An electrical connector according to claim 2, characterised in that the spiked elements are located nearer the hinging end of the assembly than the end at which the two parts press fit together.

4. An electrical connector according to claim 2 or claim 3, characterised in that both the first and second parts have formations at which the aforesaid hinging action and press fitting action are produced, and the formations on at least one part are formed as pairs of laterally spaced upstands from the main body of said part at least at the respective ends thereof, defining between said formations on one side of the part and the formations on the other side a channel along which the second electric cable can be located to pass right through the connector from one end to the other.

5. An electrical connector according to claim 4, characterised in that the laterally spaced upstands are formed on the first part of the connector.

6. An electrical connector according to claim 3 or claim 4, characterised in that the first and second parts of the connector are separable from one another, whilst also being capable of assembly into a hinging relationship.

7. An electrical connector according to claim 6, characterised in that the two separable parts of the connector are held in loose association with one another by a flexible joining tag.

8. An electrical connector according to any of claims 1 to 7, characterised in that the first electric cable is terminated within the first part of the electricl connector.

9. An electrical connector according to claim 7, characterised in that the first part of the connector is moulded firstly with a cable-receiving blind aperture extending longitudinally into it from one end of said part, and secondly with slots which extend transversely into said aperture adjacent its blind end, said slots receiving the aforesaid spiked elements as an irreversibly tight fit.

10. An electrical connector according to claim 9, characterised in that the spiked elements are formed with prongs at their ends opposite to the spikes so that, when during manufacture the spiked elements are driven into the slots, the prongs penetrate the insulating covering of the first electric cable inserted into the aforesaid blind longitudinal aperture, thereby both permanently to anchor the first part of the connector to the end of said first electric cable and to effect engagement of said spiked elements with the conductors of said first electric cable.

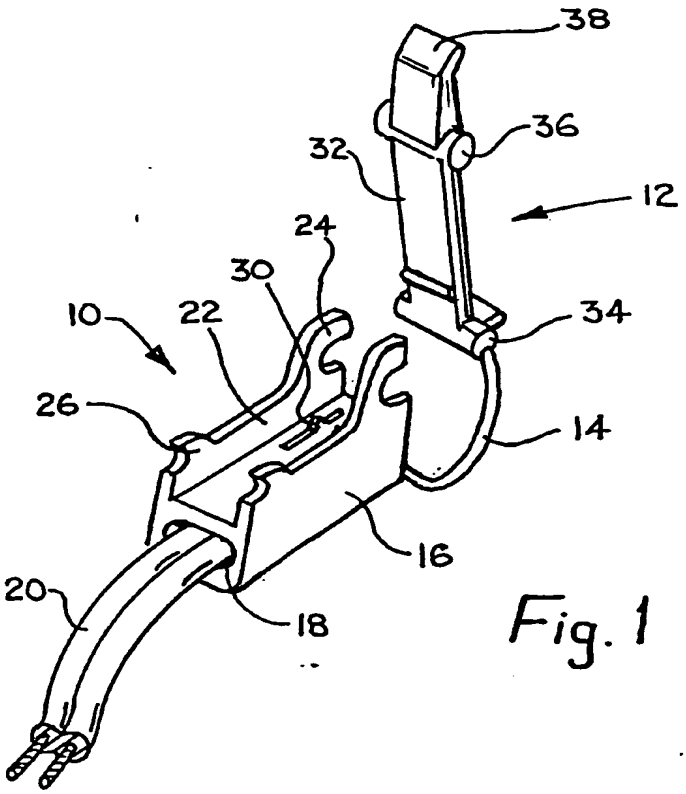

Fig. 1

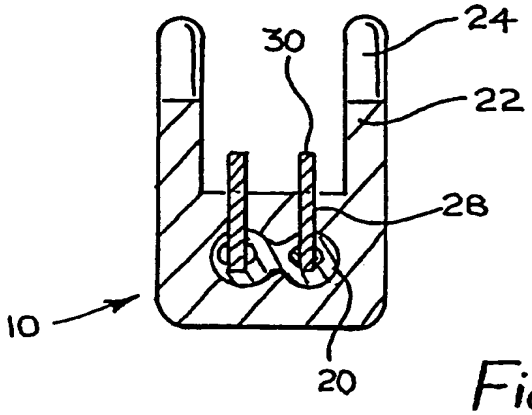

Fig. 2

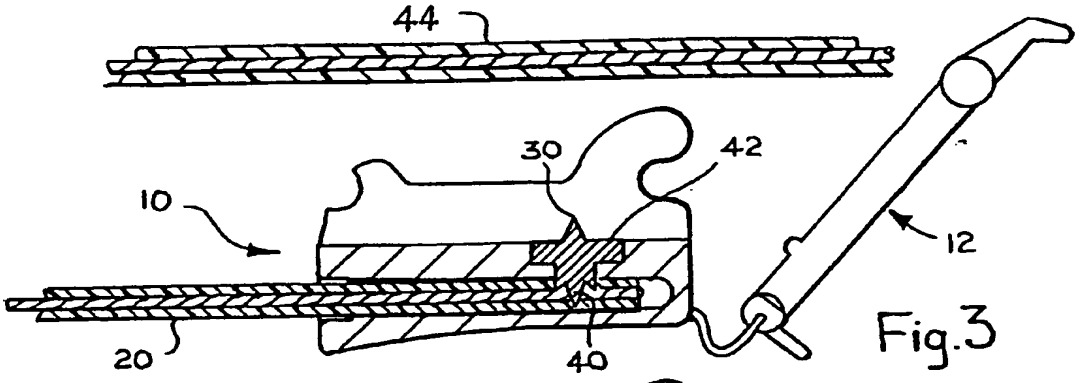

Fig.3

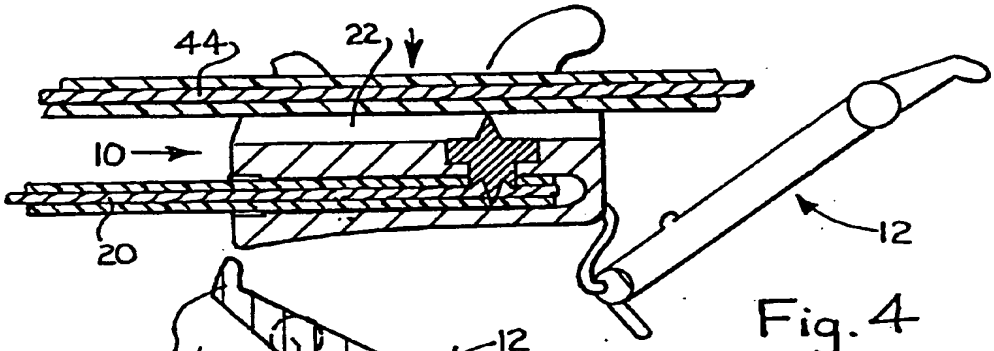

Fig.4

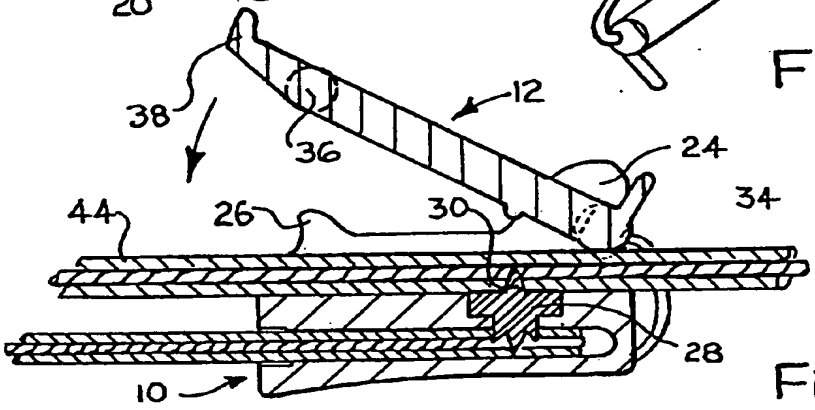

Fig.5

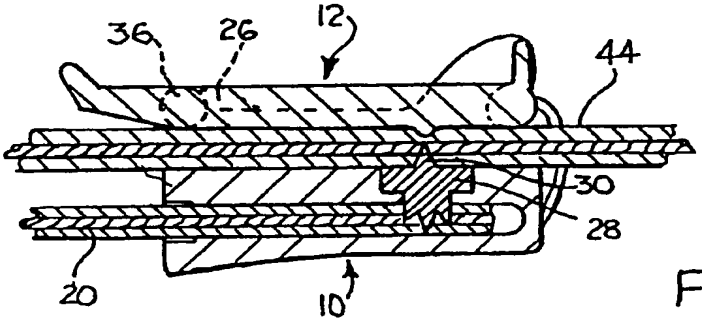

Fig.6